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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,339	02/18/2004	Roberto R. Panepucci	1153.099US1	9241
21186	7590	11/23/2005	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH 1600 TCF TOWER 121 SOUTH EIGHT STREET MINNEAPOLIS, MN 55402			STAHL, MICHAEL J	
			ART UNIT	PAPER NUMBER
			2874	

DATE MAILED: 11/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/781,339

**Applicant(s)**

PANEUCCI ET AL.

**Examiner**

Mike Stahl

**Art Unit**

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☒ Claim(s) 18,27 and 28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 8/4/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

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***Claim Objections***

Claim 18 is objected to because “supply waveguides” should be changed to “supply waveguide”. See claim 17.

Claims 27-28 are objected to because each instance of “cite” should be changed to “site”.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 7-10, 12, 15, and 27-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Tran et al. (US 2005/0018946).

Claim 1: Tran discloses an optical sensor comprising: a substrate having an opening; a cantilevered waveguide **400** (generally above body portion **200**) having a first portion supported by the substrate and a second portion suspended over the opening in the substrate; and a receiving structure (generally above body portion **100**) positioned to receive light transmitted from an end of the second portion of the cantilevered waveguide. See figs. 1A-1B.

Claim 2: The receiving structure includes a waveguide (a separated portion of waveguide **400**) having an end facing the light transmitting end of the second portion of the cantilevered waveguide.

Claim 7: The cantilever waveguide includes a selectively receptive substance attached to the second portion of the cantilever waveguide a desired distance from the light transmitting end of the second portion ([0021]-[0025]).

Claim 8: The cantilever waveguide has a resonant frequency of oscillation that changes when something attaches to the selectively receptive substance ([0068], [0069], claim 20).

Claim 9: The selectively receptive substance is bio-receptive ([0070]-[0072], [0077]-[0078], etc.).

Claim 10: The immobilized receptor on one face of the cantilever ([0041]) constitutes a stress layer formed on the cantilevered waveguide.

Claim 12: The sensor includes the elements indicated above, and further includes means for actuating the cantilevered waveguide as described in [0068] and claim 20 of the reference.

Claim 15: The means for actuating increases the sensitivity without significantly decreasing a quality factor.

Claims 27-30: The limitations of these claims are met by the Tran device described above.

Claims 1-4 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Rines (US 4414471).

Claim 1: Rines discloses an optical sensor comprising: a substrate **26** having an opening; a cantilevered waveguide **30** having a first portion supported by the substrate and a second portion **34** suspended over the opening in the substrate; and a receiving structure positioned to

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receive light transmitted from an end of the second portion of the cantilevered waveguide. See fig. 2.

Claim 2: The receiving structure **32** includes a waveguide **32** having an end facing the light transmitting end of the second portion of the cantilevered waveguide.

Claim 3: In an alternate embodiment (fig. 4), the receiving structure includes a reflector **56** facing the light transmitting end of the second portion of the cantilevered waveguide.

Claim 4: The reflector is supported by the substrate and reflects light back into the light transmitting end of the second portion of the cantilevered waveguide.

Claim 30: The process of operating the Rines device meets the limitations of this claim.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5, 6, 11, 13, 14, and 16-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al. (cited above).

Claim 5: Tran does not specifically describe an optical fiber that supplies light to the cantilevered waveguide. However, it would have been obvious to a skilled person to have used an optical fiber for this purpose since fibers generally have less transmission loss than integrated waveguides and thus this would enable the light source to be remotely located and controlled. Alternatively, in one embodiment the cantilever waveguide may itself be an optical fiber ([0030], [0055]), in which case it would have been obvious to use an optical fiber to supply light to the cantilever fiber since the interface between the two fibers would be efficient and easily established (e.g. by splicing or by mutual ferrule-type connection).

Claim 6: Tran does not specifically disclose that the cantilevered waveguide includes a nano-taper at a second end of the waveguide that contacts a light emitting end of the optical fiber. Official notice is taken that such a coupling structure is already known in the art. It would have been obvious to a skilled person to use this structure since nano-tapers are easily formed and since it would avoid the need for other coupling components (such as lenses) between the cantilever waveguide and the fiber.

Claim 11: Tran does not disclose a stress layer comprising silicon nitride. It is known in the art to add a stress layer to a cantilever to control its baseline deflection. Thus it would have been obvious to a skilled person to have used a stress layer in the Tran device to ensure that the manufactured cantilever has the desired initial alignment before it is used for sensing (see e.g.

[0040]). The use of silicon nitride would have been obvious because it is known that silicon nitride is compatible with the cantilever material used by Tran (see e.g. [0100]).

Claims 13 and 16: Tran refers to actuation in at least claim 20 but does not specify the type of actuator used. Piezoelectric and electrostatic actuators are already well known in the art. It would have been obvious to a skilled person to have used a piezoelectric actuator or an electrostatic actuator since they are widely available and can be easily integrated with the Tran device.

Claim 14: It would have been obvious to a skilled person to have placed the piezoactuator below the substrate because this could keep it (and its associated power supply or control circuitry) out of the path of a fluid to be analyzed.

Claim 17: Tran discloses an optical sensor having all the recited elements except for the ring resonators coupled between the cantilever waveguides and the supply waveguide ([0081]-[0086]). Official notice is taken of the fact that ring resonators are commonly used in the art for demultiplexing signals from a main waveguide or multiplexing signals onto a main waveguide. As discussed in [0085] of Tran, waveguides fixed to multiple cantilevers can be joined at a single source waveguide, and light from a light source can be demultiplexed among the various cantilever waveguides. It would have been obvious to a skilled person to have used ring resonators as the demultiplexers in this embodiment since they are compact, are highly selective in terms of wavelength, and can be readily integrated with the other waveguides of the device. The proposed modification would have met the requirements of claim 17.

Claim 18: It would further have been obvious to have used the ring resonators to couple light of different wavelengths between the cantilever waveguides and the supply waveguide,

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since this would make it easier to identify the particular cantilever waveguide which provided a given sensor response. This would be a useful feature for example in an embodiment having a distinct receptor species on each cantilever waveguide (see e.g. [0023]).

Claim 19: The cantilevered waveguides may have different resonant frequencies ([0084]).

Claim 20: The use of reflectors instead of waveguides as receiving structures in cantilever-type sensors is already known in the art. It would have been obvious to a skilled person to have used reflectors as the receiving structures in the Tran arrangement since this would beneficially reduce the number of waveguides to be fabricated and reduce the overall size of the device.

Claim 21: The receiving structures comprise waveguides (see above with respect to claim 2).

Claims 22-23: In one embodiment, the cantilever waveguides are all coupled to a common receiving waveguide ([0088]). Since the modification proposed above with respect to claim 17 includes ring resonators for demultiplexing purposes, it would have been obvious to a skilled person to have also used ring resonators to multiplex the signals back together after passing the respective cantilever waveguides for the same reasons (compactness, selectivity, easy integration). These additional ring resonators would naturally be tuned to corresponding ring resonators on the input side so as to pick up the correct wavelengths of the signals which pass through the cantilever waveguides.

Claim 24: The second portions of the cantilever waveguides may have different lengths ([0047], [0084]).



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Claim 25: See above with regard to claim 10.

Claim 26: The recited limitations are satisfied by the modification proposed above relative to claim 17, noting that actuating means are also present as indicated above relative to claim 12.

### *Conclusion*


The additional references listed on the attached PTO-892 form are considered relevant to this application.

Inquiries about this letter should be directed to Mike Stahl at 571-272-2360. Inquiries of a general or clerical nature (e.g., a request for a missing form or paper, etc.) should be directed to the technical support staff supervisor at 571-272-1626. Official communications which are eligible for submission by facsimile and which pertain to this application may be faxed to 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Mike Stahl  
Patent Examiner  
Art Unit 2874

November 20, 2005

  
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